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A. Albers / T. Alink

Support of design engineering activity through the Contact and Channel Model – the importance of a contious and systematic model building

Background

Research in engineering design methodology of the past years has revealed several lacks of the “classical” design methodologies. Especially the negligence of the thinking and troubleshooting engineer in the phases where the relation of function and form is regarded are in the focus of critics. The predominantly systematic-analytic, on deductive procedure based design methodologies are still basis for research and also education in engineering design, but are judged to be little applicable in a real designing environment (e.g. Bender [1] and Lossack [2]). Hence, the trend of design research has put in the middle of focus the designer as a problem solving individual acting in teams.
On the other side, the more and more complex structures of the designed products, regarded as objects of the problem solving process, afford reliable representations, which are adaptable to the mental representations of designers. This contribution describes the exploration of the Contact and Channel Model (C&CM) approach for a successful proceeding in solving design engineering problems.

Contact and Channel Model (C&CM)

The C&CM is a flexible and basic way of modeling function and form equally in order to explore critically and design the functionality of complex technical issues. The C&CM provides a systematic product model by means of specific elements which are clearly defined on the abstract level of functions as well as on the concrete level of components. Thus, the level of abstraction of the design problem can be adjusted individually by the operating design engineer. These elements, Working Surface Pairs (WSP) and Channel and Support Structures (LSS), allow different resolutions of product representation for an optimized and flexible overview over the design problem.

The current focus of the research is on the explanation of the importance of a throughout the product development continuous way of modeling. In a further concrete example of a design project conducted in an industrial environment, like also described in [3] and [4] it is shown how important it is to be able to relate the bits and pieces of information of different accuracy.

The Importance of a continous modelbuilding in design problem solving

From the beginning of the design process, some aspects of the design are well worked out and others much less. Designers have to handle a combination of uncertain and fuzzy information regarding new parts of the design, while finding a solution for over-constraint problems when they are incorporating existing components. In order to understand technical systems, in order to create and manipulate them, the manifoldness and complexity of the systems must be broken down. This happens preferably through four never strictly separable procedures: decomposition in elements, abstraction, formalisation and coarsening“[5]. The research on the C&CM shows how important it is for the creative and target oriented generation of new concepts to apply a continuous representation of the problem within these four never strictly separable procedures. The evaluation of new ideas within the concrete unalterable boundary conditions on a C&CM basis supports meeting strict project deadlines and budget limits.

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